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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/611,589	06/30/2003	B. Michelle Chen	AMAT/1717.D2/CPES/DT/PJS	5241

7590 12/21/2005

Patent Counsel  
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EXAMINER

WYSZOMIERSKI, GEORGE P

ART UNIT	PAPER NUMBER
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1742

DATE MAILED: 12/21/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/611,589

Applicant(s)

CHEN ET AL.

Examiner

George P. Wyszomierski

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 03 October 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1,5-9 and 11-14 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,5-9,11-14 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

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1. The Amendment filed October 3, 2005, which canceled a number of claims and amended other claims, has been entered. The pending claims are claims 1, 5-9, and 11-14.

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1, 5-9, and 11-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Sandhu et al. Advanced Metallization Conference reference in view of Kitazawa et al. (U.S. patent 6,178,623).

Sandhu discloses electroplating copper on a substrate followed by heat treating for 5 minutes in an atmosphere comprising nitrogen and hydrogen at a temperature of, e.g. 200 or 250 degrees C (see Figures 5 and 6 of Sandhu). With respect to the newly claimed "first chamber" and "second chamber" limitations, it appears that Sandhu performs the annealing in a "Blue M inert gas oven" (see page 211 of Sandhu), which would be a chamber distinct from that in which the electroplating of Sandhu is performed.

Sandhu does not disclose rinsing prior to heat treating, does not specify a hydrogen content less than 4% as in instant claim 4, does not specify treating in an environment of less than 100 ppm oxygen as required by instant claims 8 and 13, and does not specify a pressure of 760 torr as required by claims 9 and 14. These differences are not seen as resulting in a patentable distinction between the prior art and the claimed invention because:

a) Kitazawa, particularly column 11, lines 23-26 therein, indicates it was conventional in the art, at the time of the invention, to rinse an electroplated copper layer prior to heat treatment in an inert atmosphere such as a nitrogen atmosphere.

b) Sandhu performs annealing both in a substantially nitrogen atmosphere and in a 95% nitrogen-5% hydrogen atmosphere; see Figure 5 of Sandhu and its accompanying text. Thus, the use of an atmosphere between these two particular embodiments, e.g. one with less than 4% hydrogen, would fall within the purview of Sandhu.

c) With respect to oxygen, page 211 of Sandhu emphasizes that the copper in the prior art readily reacts with oxygen and therefore it is important to anneal in a controlled, inert environment. Thus, use of a severely limited amount of oxygen as presently claimed would have been obvious from the Sandhu disclosure.

d) Sandhu page 213 indicates that the oven used for heat treating in the prior art was not leak tight and operates only at 0.5 psi (26 torr) higher than atmospheric pressure (760 torr). This difference of approximately 3.4% in the pressure between the prior art and the claimed invention is held to be of no patentable moment.

Consequently, the combined disclosure of Sandhu et al. together with that of Kitazawa et al. would have rendered the claimed invention obvious to one of ordinary skill in the art.

4. Claims 1, 5-9, and 11-14 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-39 of copending Application No. 10/074353 in view of Kitazawa et al.

The pending claims of the '353 application define a process which includes depositing a copper layer on a substrate followed by annealing under time, temperature, and atmospheric conditions (e.g. nitrogen + hydrogen) which overlap those as defined in the instant claims. The

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'353 claims do not disclose a rinsing step, as required by the instant claims. Kitazawa, particularly column 11, lines 23-26 therein, indicates that it was conventional in the art, at the time of the invention, to rinse an electroplated copper layer prior to heat treatment in an inert atmosphere such as a nitrogen atmosphere. Therefore, the claims of the '353 application, combined with the teachings of Kitazawa et al., would have taught the invention of the instant claims to one of ordinary skill in the art.

This is a provisional obviousness-type double patenting rejection.

5. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

6. In the amendment of October 3, 2005, Applicant has significantly amended the present independent claims. The examiner agrees with Applicant that the prior art to Martin, Ames et al., Uzoh et al., Maeda, and Simpson et al. is no longer applicable to

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the pending claims. However, the claims remain rejected for reasons as set forth in items 3 and 4 supra.

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to George Wyszomierski whose telephone number is (571) 272-1252. The examiner can normally be reached on Monday thru Friday from 8:00 a.m. to 4:30 p.m. Eastern time.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King, can be reached on (571) 272-1244. All patent application related correspondence transmitted by facsimile must be directed to the new central facsimile number, (571)-273-8300. This new Central FAX Number is the result of relocating the Central FAX server to the Office's Alexandria, Virginia campus.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

GPW  
December 19, 2005

  
GEORGE WYSZOMIERSKI  
PRIMARY EXAMINER  
GROUP 1742